**REMARKS**

In the Office Action mailed March 4, 2009, claims 1, 4-7, 9-13, 27, and 30-48 were pending for consideration, all of which were rejected, as is addressed below. The Applicant respectfully submits that the present claims are allowable over the cited references.

35 U.S.C. § 103 Rejections:

The Examiner has rejected claims 1, 4-7, 9-13, 27, and 30-48 under 35 U.S.C. § 103(a) as being allegedly unpatentable over Goers et al. (U.S. Patent 6,722,952) in view of Homola (US 2004/0096705) and Sung (U.S. Patent 6,368,198). It appears that the Sung patent was incorrectly cited in the last office action. If a different patent was intended to be cited than 6,368,198, the Examiner is urged to contact the Applicant's representative so that an appropriate correction can be made. The Applicant respectfully submits that the combination of Goers, Homola, and Sung does not teach or suggest each and every element of the present claims, and therefore the Patent Office has not established a *prima facie* case of obviousness.

Goers teaches an abrasive article including a backing and an abrasive coating bonded to the surface of the backing. The abrasive coating comprises a plurality of diamond bead abrasive particles held in a binder and including a filler (col. 3, lines 49-52). Goers teaches that the binder can be a variety of organic materials (col. 3, line 47 through col. 5, line 63). As is described in col. 2, lines 34-37, "[t]he level of the filler is chosen to provide an abrasive coating which will erode under typically[sic] use conditions thereby exposing and releasing new diamond bead abrasive particles." Thus the filler is utilized by Goers for the express purpose of allowing the abrasive coating to degrade during use to expose and release diamond bead abrasive particles. The Goers reference does not disclose nanodiamond abrasive particles having a particle size from

about 1 nm to about 50 nm, nor does it disclose that the nanodiamond particles include a carbonaceous coating.

Homola teaches a method for texturing a substrate for a magnetic disk comprising abrading the substrate using nano-sized diamond particles (abstract). The nano-sized diamond particles can be free abrasive particles within a liquid such as a slurry, or they can be fixed abrasive particles bound to an abrasive cloth or other structure (paragr. [0009]). As with the Goers reference, Homola does not disclose nanodiamond particles having a carbonaceous coating.

Sung teaches a CMP pad dresser having a plurality of uniformly spaced abrasive particles protruding from a braze matrix. As is described in the background section of Sung, abrasive particles are dislodged from the tool as a result of acids in the chemical slurry weakening the chemical bonds between the braze matrix and the abrasive particles (col. 2, lines 10-17). Sung teaches that an anticorrosive layer is therefore coated over the surface of the CMP pad dresser after the abrasive particles have been affixed to the substrate in order to protect the dresser from chemical attack, to prevent abrasive particle dislodgment, and to prevent the dissolution of elements from the disk (col. 2, lines 38-47; col. 6, lines 22-41).

Claim 1 includes limitations to a fixed abrasive tool having, *inter alia*, a substrate and a polishing layer, where the polishing layer includes an organic matrix with nanodiamond particles therein. These nanodiamond particles include a carbonaceous coating selected from the group consisting of fullerenes, carbon onions, carbon nanotubes, diamond-like carbon, and combinations thereof.

The Examiner has argued that, while neither Goers nor Homola teach or suggest a carbonaceous coating, the anti-corrosive DLC layer of Sung provides such a teaching, and that such a teaching is combinable with Goers and Homola. Specifically, the Examiner has asserted

that it would have been obvious to one of ordinary skill in the art to have provided Goers with the coating taught by Sung to protect the bonding material of the tool. The Applicant respectfully disagrees.

As a first matter, the Applicant does not believe that the teachings of the Goers and Sung references can be combined together because they are very different types of tools having very different functions. The Goers device is a fixed abrasive pad used to abrade material from a glass or ceramic workpiece. This abrading action would be similar to the abrading action that is accomplished by a CMP pad abrading a semiconductor wafer. Sung, on the other hand, teaches a CMP pad dresser, and not a CMP pad or other fixed abrasive device. Rather than abrading material from a hard surface such as a glass material or a wafer, the CMP pad dresser is used to unclog and dress the surface of a soft CMP pad. A DLC coated diamond dresser applied to the spinning surface of a semiconductor wafer would cause catastrophic scratching, thus potentially destroying the wafer. Given these very different functions, one of ordinary skill in the art would not have taken a teaching from one and applied it to the other, particularly given the very disparate surfaces upon which the tool is used.

Additionally, and as has been described, Sung teaches an anticorrosive DLC coating to prevent the degradation of the metal braze matrix that is chemically bonded to the diamond abrasive particles. Thus in protecting this chemical boundary, diamond particles are precluded from being dislodged from the braze matrix. One of ordinary skill in the art would not have had sufficient motivation to combine this teaching with Goers. First, the Examiner has stated that motivation for such a combination could be to protect the bonding material of the tool. While Sung showed a need to protect a metal matrix from degradation by a chemical slurry, one of ordinary skill in the art would understand that the binder materials of Goers are not as susceptible

to chemical attack. Additionally, when a 100 to 350 micron diamond is dislodged from a CMP pad dresser of Sung (col. 7, lines 4-5), the results can be catastrophic to a wafer being polished. Therefore, Sung teaches that the anti-corrosive layer is critical to prevent chemical degradation of the metal matrix. Goers, one the other hand, includes a filler in the binder material for the express purpose of facilitating the release of abrasives. Such a release of abrasives could not occur if the abrasive coating were coated with a DLC layer as suggested by the Examiner. Accordingly, the Examiner has not shown motivation for such a combination, and therefore has not established a *prima facie* case of obviousness. Reconsideration is requested.

Additionally, the combination of Goers and Sung cannot be made because such a modification would destroy the functionality of the Goers reference. As has been described, Goers includes a filler in the abrasive coating to facilitate the breakdown of the binder and the release of abrasives therefrom. Providing any type of anti-corrosive layer over the surface of the abrasive layer would preclude such a breakdown, and thus destroy the functionality of the device.

It should also be noted that polishing pads, including those made from the materials suggested by Goers, are softer than metal matrix pads and often have a porous structure to hold and move liquids applied during the polishing procedure. Assuming, *arguendo*, the surface of these pads were somehow coated with a layer of DLC, not only would the nonporous nature of DLC disrupt the flow of liquid across the wafer, but this hard layer would likely crack as the pad was pressed into the wafer.

The Applicant additionally asserts that one of ordinary skill in the art would not have had sufficient likelihood of success for making the combination. As has been described, the anticorrosive layer of Sung is applied over the surface of the dresser to protect the metal matrix from chemical degradation. While DLC layers can readily be applied to various metal materials,

one of ordinary skill in the art would understand that a DLC layer could not be deposited onto the polymeric materials taught by Goers, particularly given the operation temperatures of PVD and CVD processes used to deposit such layers. As such, one of ordinary skill in the art would not have attempted to make such a modification as there would be no understanding as to how to accomplish the deposition of the DLC layer successfully. Reconsideration is respectfully requested.

Additionally, claim 27 contains limitations to a method of removing material from a work piece using an abrasive tool having the same carbonaceous coating limitations. As such, the Applicant asserts that a *prima facie* case of obviousness has not been established for the reasons given above. Furthermore, claims 4-7, 9-13, and 30-48 depend from claims 1 and 27 and are thus narrower in scope, and they will also not be discussed in detail. It is assumed that they are allowable along with these independent claims. Reconsideration is respectfully requested.

## CONCLUSION

In view of the foregoing, the Applicants assert that claims 1, 4-7, 9-13, 27, and 30-48 present allowable subject matter, and their allowance is respectfully requested. If any impediment to the entry of this Amendment and allowance of these claims remains after consideration of the above remarks, and such impediment could be removed during a telephone interview, the Examiner is invited to telephone Mr. David Osborne at (801) 566-6633, so that such issues may be resolved as expeditiously as possible.

Please charge any additional fees except for Issue Fee or credit any overpayment to Deposit Account No. 20-0100.

Dated this 4th day of June, 2009.

Respectfully submitted,

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